इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 8019 (1976): Dental Artificial Stone [MHD 8: Dentistry]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA
JURIS
NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 8019 - 1976

(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR DENTAL ARTIFICIAL STONE

UDC 616·314-089·28-77 : 666·913·046

© *Copyright* 1976

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Rs 6·00 Gr 3

July 1976

Indian Standard

SPECIFICATION FOR DENTAL ARTIFICIAL STONE

Dental Materials Sectional Committee, CDC 52

Chairman

Dr N. K. Agrawal
Dental College & Hospital, Lucknow

Members	*Representing*
Dr P. K. Basu	Dr R. Ahmed Dental College & Hospital, Calcutta
Dr K. S. Gill	Punjab Government Dental College & Hospital, Amritsar
Dr (Smt) T. M. S. Ginwalla	Nair Hospital & Dental College, Bombay
Dr F. D. Mirza (*Alternate*)	
Shri A. K. Govande	Dental Products of India Ltd, Bombay
Shri Desmond De Beynac Sheen (*Alternate*)	
Dr B. Goverdhan Hegde	Government Dental College, Bangalore
Dr Ishar Singh	Government Medical College, Patiala
Dr R. C. Kakar	In personal capacity (*31 South Patel Nagar, New Delhi*)
Maj-Gen M. D. Mehra	Ministry of Defence (DGAFMS)
Col O. P. Bhatia (*Alternate*)	
Shri Bhupendra B. Patel	Dental Corporation of India, Bombay
Shri Narendra M. Patel (*Alternate*)	
Shri D. G. Patwardhan	Directorate General of Technical Development, New Delhi
Shri M. M. Rawal	Indo-Ceylon Dental & Surgical Co Ltd, Madras
Shri B. M. Rawal (*Alternate*)	
Shri V. M. Rawal (*Alternate*)	
Dr N. Pinto Do Rozario	Ministry of Health & Family Planning, New Delhi; *and* Willingdon Hospital, New Delhi
Dr G. B. Shankwalkar	Government Dental College & Hospital, Bombay; *and* Government Dental College & Hospital, Nagpur
Dr Balraj Sur	Indian Dental Association, New Delhi
Dr G. M. Saxena, Director (Chem)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri Naresh K. Sharma
Deputy Director (Chem), ISI

(*Continued on page* 2)

© *Copyright* 1976
INDIAN STANDARDS INSTITUTION
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Denture Materials Subcommittee, CDC 52 : 2

Convener	*Representing*
Col O. P. Bhatia	Ministry of Defence (DGAFMS)
Members	
Dr N. K. Agrawal	In personal capacity (*Dental College & Hospital, Lucknow*)
Shri A. K. Govande	Dental Products of India Ltd, Bombay
Shri S. R. Sethna (*Alternate*)	
Dr B. Goverdhan Hegde	Government Dental College, Bangalore
Dr Jacob Hyson	Government of Kerala, Health (B) Department, Trivandrum
Dr Inderjit Singh	Safdarjang Hospital, New Delhi
Dr C. N. Kothare	Unichem Laboratories Ltd, Bombay
Shri P. G. Vyas (*Alternate*)	
Prof S. B. Master	Government Dental College & Hospital, Bombay
Maj Gen M. D. Mehra	Ministry of Defence (DGAFMS)
Prof B. Sriram Murthy	Osmania Medical College, Hyderabad
Shri M. M. Rawal	Indo-Ceylon Dental & Surgical Co Ltd, Madras
Shri B. M. Rawal (*Alternate*)	
Shri V. M. Rawal (*Alternate*)	

Indian Standard

SPECIFICATION FOR DENTAL ARTIFICIAL STONE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 4 February 1976, after the draft finalized by the Dental Materials Sectional Committee had been approved by the Chemical Division Council.

0.2 Dental artificial stone is used in making dental casts and for investing (flasking) purposes. It essentially consists of autoclave calcined gypsum.

0.3 In the preparation of this standard, assistance has been derived from AS T 7:1974 'Specification for dental artificial stone' published by Standards Association of Australia.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for dental artificial stone used in making dental casts and for investing (flasking) purposes.

2. REQUIREMENTS

2.1 Description — The artificial stone shall consist essentially of autoclave-calcined gypsum. It shall be dry, uniform and free from lumps and undesirable foreign materials. The water to powder ratio of such material shall be not less than 0·30 by mass.

2.2 General — When mixed with distilled water in the manner prescribed in **A-2**, the artificial stone shall readily produce a uniform paste of workable consistency. It shall have no deleterious effect on artificial denture materials processed therein.

---

*Rules for rounding off numerical values (*revised*).

2.3 Particle Size — The particle size shall be such that when the artificial stone is tested in the manner prescribed in **A-3**, no material is retained on 600-micron IS Sieve* and not more than 2 percent is retained on 150-micron IS Sieve*.

2.4 Setting Time — The initial setting time of the mixed artificial stone, determined in the manner prescribed in **A-4**, shall be not less than 5 minutes nor more than 20 minutes and shall not differ by more than 3 minutes from the setting time marked by the manufacturer on the container.

2.5 Linear Expansion on Setting — One hour after the initial set has developed and when tested according to the method described in **A-5**, the stone shall exhibit no evidence of linear contraction and linear expansion shall not exceed 0·35 percent. In addition, such expansion shall not vary by more than 0·05 percent from that marked on the container by the manufacturer.

2.6 Compressive Strength — The ultimate compressive strength of the mixed artificial stone one hour after the commencement of the mixing procedure, when determined in the manner described in **A-6**, shall be not less than 21 MN/m^2 (211 kgf/cm^2).

2.7 Manufacturer's Instructions — Accurate and adequate instructions for storing, proportioning, mixing and using the material shall accompany each container.

3. PACKING AND MARKING

3.1 Packing — The artificial stone shall be packed in containers impervious to water vapour.

3.2 Marking — Each package shall be securely closed and shall bear legibly and indelibly the following information:

a) Name of the material;
b) Name of the manufacturer and his recognized trade-mark, if any;
c) Water powder ratio;
d) Net mass;
e) Setting time;
f) Linear expansion on setting; and
g) Batch number.

---

*See IS : 460-1962 Specification for test sieves (*revised*).

3.2.1 The packages may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

4. SAMPLING

4.1 Representative samples of the material shall be drawn as prescribed in Appendix B or as agreed to between the purchaser and the supplier.

APPENDIX A

(*Clauses* 2.2 to 2.6)

METHODS OF TEST FOR DENTAL ARTIFICIAL STONE

A-1. AMBIENT CONDITIONS

A-1.1 Carry out mixing and testing of artificial stone in a room free from draughts and in which the ambient atmospheric conditions are as follows:

Temperature	27 ± 2°C
Relative humidity	50 ± 5 percent

A-2. PREPARATION OF SAMPLE FOR TESTS

A-2.1 Materials and Apparatus — All apparatus and instruments shall be clean, dry, and free from particles of hardened gypsum. Before mixing of the artificial stone, bring the materials and apparatus to a temperature of 27 ± 2°C. Maintain the freshly prepared specimens at a temperature within this range until testing is commenced.

A-2.2 Method of Mixing — Mix sufficient artificial stone to carry out the test with distilled water in the proportions recommended by the manufacturer. Carry out the mixing in a flexible mixing bowl and sift or shake the artificial stone into the water in such a manner that the entrapment of air is avoided as far as possible and the time taken for the addition of the powder is approximately 15 seconds. During the next 15 seconds jar the bowl slightly to facilitate wetting of the artificial stone and the elimination of any entrapped air. Then spatulate the artificial stone and the water for 30 seconds using, a circular stirring motion at a rate of approximately three turns per seconds and transfer the mixed artificial stone so formed forthwith to the moulds or testing apparatus.

A-3. DETERMINATION OF RESIDUE ON SIEVING

A-3.1 Apparatus

A-3.1.1 *Sieves* — 150-micron and 600-micron IS Sieves (*see* IS : 460-1962*).

A-3.2 Procedure — Place 100 g of artificial stone on a 600-micron IS Sieve and shake through on to a 150-micron IS Sieve. Then wash through the material on the sieves by agitating the sieves in a vessel containing dry isopropyl alcohol. Wash the residue with a stream of fresh alcohol until the washings are clear. Dry the sieve at room temperature. When the residue is dry, shake the sieve gently by hand for approximately one minute to remove fine particles adhering to the sieve. Remove any residue remaining on the respective sieves, weigh and report as the percentage retained.

NOTE — To ensure dryness the alcohol may be prepared by saturating it with an excess of calcined gypsum powder, pouring off the alcohol after settling and keeping the alcohol in a stoppered bottle.

A-4. DETERMINATION OF SETTING TIME

A-4.1 Apparatus

A-4.1.1 *Symmetrically-Loaded Indentor* — conforming to the following requirements:

Mass	100 ± 0·5 g
Diameter	2·00 ± 0·01 mm

The indentor tip shall be cylindrical for a distance of about 5 mm. The end of the indentor shall be plane and at right angles to the axis of the indentor and shall be maintained in a clean condition.

NOTE — This indentor is to be equivalent to but not necessarily identical with the ‘ Gillmore initial needle ’.

A-4.1.2 *Ring Mould* — of the following minimum dimensions:

Internal diameter	20 mm
Height	5 mm

A-4.2 Procedure — Place the ring mould on a flat glass plate and fill with artificial stone mixed in the manner described in **A-2.2**. Lower the indentor gently and vertically on to the surface of the artificial stone. Repeat this at frequent intervals. The artificial stone shall be deemed to have set when the indentor fails to leave a perceptible circular indentation on the surface of the specimen.

---

*Specification for test sieves (*revised*).

A-4.2.1 The setting time shall be the number of minutes that have elapsed between the commencement of the mixing and the time when the artificial stone has set. Two such complete determinations shall be carried out. Report the mean of the two results to the nearest half-minute as the setting time of the stone.

A-5. DETERMINATION OF LINEAR EXPANSION ON SETTING

A-5.1 Apparatus

A-5.1.1 A dilatometer which incorporates the following features:

a) A steel block with a highly polished V-shaped or semi-circular groove approximately 15 cm long,

b) Two steel end-pieces accurately ground and polished to be a good sliding fit in the groove when greased,

c) Means of fixing one of the end-pieces, and

d) Means of measuring the change in length of the specimen to within 0·01 mm without applying a restraining force.

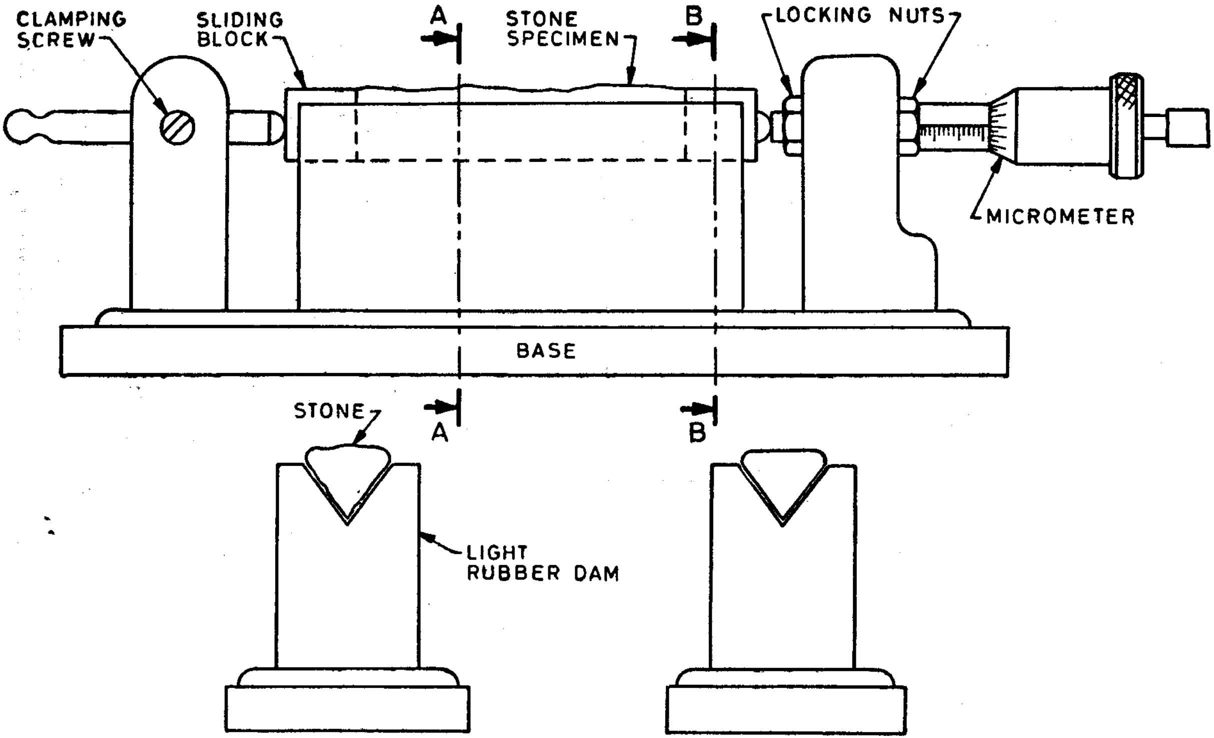
A convenient form of dilatometer is shown in Fig. 1. In this apparatus the steel block is mounted on a rigid base fitted with two uprights, one of which holds a micrometer head capable of being read to 0·01 mm, and the other a tailstock to prevent movement of one of the end-pieces during the test. With this apparatus the gauge length is the full length of the specimen.

A-5.1.2 *Light Rubber Dam*

A-5.2 Procedure — Fix one end-piece at one end of the groove so that movement of the stone in that direction is prevented, grease the other end and place in the groove to provide a trough not less than 10 cm long. Line the surface of the groove between the end-pieces with a single sheet of light rubber dam, and then cast the artificial stone, prepared in the manner described in **A-2.2**, into the groove to form a specimen with a gauge length of not less than 10 cm. The gauge length may be the full length of the specimen or may be marked by suitable markers set in the specimen near each end. As far as practicable the surface of the specimen shall be covered with rubber dam.

When the artificial stone has developed its initial set, measure the gauge length and take the initial reading for the measurement of change of length. Then allow the specimen to expand in the groove with one end free from restraint. Measure the change in the length of the specimen to the nearest 0·01 mm at the end of 1 hour and again at the end of 24 hours after the initial measurement was taken and express the linear expansion as a percentage of the original gauge length.

NOTE — Two such determinations shall be carried out using different mixes of the artificial stone.



SECTION AA

SECTION BB

Fig. 1 Dilatometer

A-5.2.1 *Reporting* — The mean of the two results shall be reported to the nearest 0·01 percent as the linear expansion on setting of the stone.

A-6. DETERMINATION OF COMPRESSIVE STRENGTH

A-6.1 Apparatus

A-6.1.1 *Compressive Testing Machine* — Up to a force of 50 kN with a cross head speed of 0·25 ± 0·05 mm per minute.

A-6.1.2 *Mould* — Rigid and demountable, designed to produce one or more plaster cubes of 25·0 ± 1·0 mm side.

A-6.1.3 *Plate* — of glass or metal, flat and smooth.

A-6.2 Preparation of Specimens — Place the mould on the plate and fill with stone. Mix the stone in the manner described in **A-2.2.** Work the stone slightly in the mould to remove any remaining air bubbles, allow to soft set, and then level off flush with the top of the mould. After the specimen has become sufficiently hard to handle, remove it from the mould, remove any flask carefully and store the specimen under ambient conditions.

A-6.3 Procedure

A-6.3.1 Just prior to testing, place one side of the cube, which was in contact with the mould, centrally on the lower platen of the test machine. The top platen shall be self-aligning. At 60 ± 10 minutes after commencement of mixing apply the compressive force at the rate of 0·25 ± 0·05 mm/min until fracture occurs and record the maximum force to the nearest 5 N.

Calculate the compressive strength of the specimen in meganewtons (MN) as the force at fracture in newtons (N) divided by the area of the specimen in mm^2 normal to the direction of the applied force.

Carry out five such determinations using at least two different mixes of stones.

A-6.4 Reporting — Report the average of the five results to the nearest 0·1 MN as the compressive strength of the stone. If, however, the compressive strength of one or two specimens differ by more than 15 percent from the average of five, discard these values and report the compressive strength as the average of the remaining specimens. If the compressive strength of three or more specimens differs by more than 15 percent of the average, discard the results and repeat the test.

APPENDIX B

(*Clause* 4.1)

SAMPLING OF DENTAL ARTIFICIAL STONE

B-1. GENERAL REQUIREMENTS OF SAMPLING

B-1.0 In drawing, preparing, storing and handling test samples, the precautions and directions given in **B-1.1** to **B-1.6** shall be observed.

B-1.1 Samples shall not be taken in an exposed place.

B-1.2 The sampling instrument shall be clean and dry.

B-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

B-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

B-1.5 The samples shall be placed in clean, dry, airtight glass or other suitable containers.

B-1.6 Each sample container shall be sealed airtight with a suitable stopper after filling, and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

B-2. SCALE OF SAMPLING

B-2.1 Lot — All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture the containers belonging to the same batch shall be grouped together and each such group shall constitute a separate lot.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of this specification.

B-2.2 The number of containers *n* to be chosen from the lot shall depend on the size of the lot *N* and shall be as given in Table 1.

B-2.3 The containers shall be selected at random from the lot and in order to ensure the randomness of selection, the random sampling methods given in IS:4905-1968* may be followed.

---

*Methods for random sampling.

TABLE 1 NUMBER OF CONTAINERS TO BE SELECTED FOR SAMPLING

LOT SIZE N (1)	NUMBER OF CONTAINERS TO BE SELECTED n (2)
Up to 50	3
51 to 200	4
201 ,, 400	5
401 ,, 650	6
651 ,, 1 000	7

B-3. TEST SAMPLES AND REFEREE SAMPLE

B-3.1 Preparation of Test Samples

B-3.1.1 Draw with an appropriate sampling instrument a small portion of the material from different parts of each container selected (*see* Table 1). The total quantity of the material drawn from each container shall be sufficient to conduct the tests for all the characteristics given under **2**.

B-3.1.2 Thoroughly mix all portions of the material drawn from the same container. Out of these portions, equal quantities shall be taken from each selected container and shall be well mixed together so as to form a composite sample. This composite sample shall be divided into three equal parts, one for the purchaser, another for the supplier and the third for the referee.

B-3.2 Referee Sample — The referee sample consists of a composite sample marked for this purpose and shall bear the seals of the purchaser and the supplier. It shall be kept at a place agreed to between the purchaser and the supplier and shall be used in case of dispute between the two.

B-4. TESTS

B-4.1 Tests for all characteristics given in **2** shall be conducted on the composite sample.

B-5. CRITERION FOR CONFORMITY

B-5.1 The lot shall be declared as conforming to this specification if the composite sample satisfies the requirements for each of the characteristics listed in **2**. If the requirements for any of the characteristics are not met, the lot shall be declared to have not satisfied the requirements of the specification.

INDIAN STANDARDS
ON
DENTAL MATERIALS AND ALLIED PRODUCTS

IS:	
3571-1966	Dental gold solders
3578-1966	Dental gold alloy wire
3610-1966	Dental gold foil
4704-1968	Silver-tin dental amalgam alloy
4705-1968	Dental mercury
4799-1968	Dental casting gold alloys
5954-1970	Dental white gold alloys
6035-1970	Zinc phosphate dental cement
6036-1970	Alginate dental impression material
6037-1970	Zinc oxide-eugenol dental impression paste
6038-1970	Dental impression compound
6039-1970	Zinc oxide-eugenol dental cement
6043-1970	Copper phosphate — zinc phosphate dental cement
6555-1972	Dental laboratory plaster
6556-1972	Dental impression plaster
6884-1973	Dental silicate cement
6887-1973	Denture base polymer
6888-1973	Dental inlay casting wax
7225-1974	Dental cobalt chromium casting alloys
7348 (Part III)-1975	Glossary of terms relating to dentistry: Part III Dental materials
7425-1974	Dental casting investment for gold alloys
7966-1976	Dental modelling wax
8019-1976	Dental artificial stone
8020-1976	Baseplate, dental
8021-1976	Dental sticky wax
8022-1976	Acrylic resin teeth

AMENDMENT NO. 1 OCTOBER 1980

TO

IS:8019-1976 SPECIFICATION FOR DENTAL ARTIFICIAL STONE

Alterations

(*Page* 7, *clause* A-5.1) - Substitute the following for the existing clause :

" A-5.1 Determine the linear expansion on setting of the material by the method prescribed in A-5 of IS:6555-1972 'Specification for dental laboratory plaster'."

(*Pages* 7 *and* 9, *clauses* A-5.1.1, A-5.1.2, A-5.2 and A-5.2.1) - Delete.

(CDC 52)

Reprography Unit, ISI, New Delhi